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Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

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Attest *Ellie M. Pearson*



US006151532A

United States Patent [19]

Barone et al.

[11] **Patent Number:** **6,151,532**[45] **Date of Patent:** **Nov. 21, 2000****[54] METHOD AND APPARATUS FOR
PREDICTING PLASMA-PROCESS SURFACE
PROFILES****[75] Inventors:** **Maria E. Barone**, Sunnyvale; **Richard A. Gottscho**, Pleasanton; **Vahid Vahedi**, Albany, all of Calif.**[73] Assignee:** **Lam Research Corporation**, Fremont, Calif.**[21] Appl. No.:** **09/033,997****[22] Filed:** **Mar. 3, 1998****[51] Int. Cl.⁷** **G06F 19/00****[52] U.S. Cl.** **700/121; 700/46; 700/47; 700/108; 700/109; 700/117; 700/123; 438/729; 324/460; 324/464; 204/192.13; 204/192.33****[58] Field of Search** **700/32, 34, 46, 700/47, 48, 108, 109, 121, 117, 123, 28, 29, 31, 44; 438/729; 324/460, 464; 204/192.13, 192.33****[56] References Cited****U.S. PATENT DOCUMENTS**

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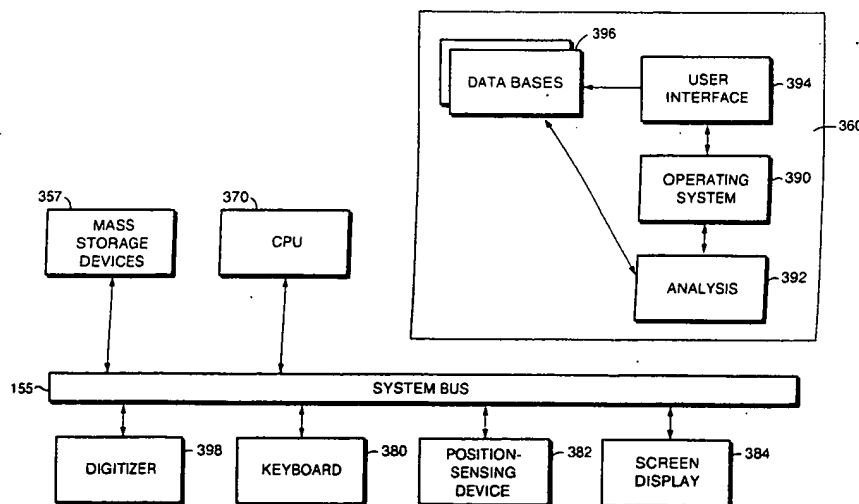
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(List continued on next page.)

Primary Examiner—Paul P. Gordon**Assistant Examiner**—Ramesh Patel**Attorney, Agent, or Firm**—Cesari and McKenna, LLP**[57] ABSTRACT**

The invention provides a method for predicting a process surface profile that a given plasma process will create on a process substrate. The prediction is based on a test surface profile, the experimental outcome of a test process which is in general different from the plasma process of interest. In another aspect, the invention provides a technique for defining a plasma process that will produce a desired surface profile. Thus, in related aspects, the invention also provides apparatus for predicting a process surface profile and determining process values, a method of configuring a plasma reactor, a method of making semiconductor devices requiring limited empirical calibration, and a device made according to the method.

28 Claims, 3 Drawing Sheets**BEST AVAILABLE COPY**